

Status and Job Satisfaction of Greek Forest Workers

Petros A. Tsioras

Accepted: 21 February 2011 / Published online: 24 March 2011
© Steve Harrison, John Herbohn 2011

Abstract The aim of this study was to examine the perception of forestry experts and forest workers on the status of the forest workers in Greece. A postal questionnaire was distributed to 115 experts on forest operations in Greece, and 106 forest workers were interviewed in the context of this study. According to the majority of the study participants, there is lack of interest on behalf of the State and the most pressing problems are income-related. The effectiveness of seminars organized during the last years is under question, since they did not result in fewer or less severe accidents. Despite the mentioned problems, the interviewed forest workers are reluctant to change their jobs, indicating a possible potential for maintaining or even increasing employment in forestry, which would warrant further study. The organization of a forest workers' training system along with institutional changes can significantly improve the quality and the employment conditions of the Greek forest operations' sector.

Keywords Forest operations · Employment · Professional public image · Forest workers training · Questionnaire · Greece

Introduction

Forest professions belong to the most dangerous jobs in all fields of production (Poschen 1993, Mitchell et al. 2001, Lindroos and Burström 2010). It is estimated that in all subsectors of forestry about 10 million people are employed worldwide (FAO 2010). Official data show a major decrease in the number of forest workers, in many European countries (Jacob et al. 1994; Gröger and Lewark 2002;

P. A. Tsioras (✉)

Laboratory of Forest Utilization, Faculty of Forestry and Natural Environment, Aristotle University of Thessaloniki, POB 227, 541 24 Thessaloniki, Greece
e-mail: ptsioras@for.auth.gr

BUS/BUWAL 2003). According to Salminen et al. (1999), the numbers of Finnish forest workers was cut down by 50% in the period 1990–1995 as a result of increased mechanization. In Sweden, the number of the forest workers has been reduced by 90%, from 100,000 to 10,000 during the last 40 years for the same reason (Axelsson, 1998).

Employment in the primary sector in the years 1998–2009 declined by 30% from 17.5 to 12.3% in Greece (National Statistical Service of Greece 2008), following the international trend which, has been described as inevitable (OECD 2000). Official data shows a steady decline in the number of forest workers in Greece. However, the exact size of the forestry workforce cannot be estimated from the official data due to the unknown number of the inactive members of the forest cooperatives but is estimated to be around 9,000 (Tsioras 2004; Ministry of Rural Development and Food 2006).

Various reasons drive the forest workers to change their job. The prevailing reasons are high accident rates, work related illnesses, low social profile, low chances for promotion and increased working hours (Lewark and Härle 1991; Jacob et al. 1994; Blombäck et al. 2003). However, studies have shown that entrepreneurship possibilities exist in forestry, which can maintain or increase the current forestry workforce, under the precondition that changes in education, incentives and work conditions take place and a successful framework for the promotion of forest sector enterprises is established (Efthymiou 2001; Uusitalo and Markkola 2006).

Forest operations have always been a major source of income for the inhabitants of mountainous areas in Greece. Motor manual methods are used: Trees are felled with a chainsaw, while skidding of trees is conducted with mules, tractors, Unimogs and a limited number of skidders. The forest workers are organized in forest workers' cooperatives (FWCs), which are almost exclusively responsible for the total of work volume both in public and private forests.

Most of the Greek forest workers have completed only the primary education or part of it and some of them have only attended short period seminars organized by the Forest Service. The lack of a vocational training and certification system damages Greek Forestry in various aspects: The quality and quantity of work are affected, the frequency of accidents is high (Efthymiou 1990) and the effort to promote a modern sustainable forest management is made more difficult (Efthymiou 1989, 1992; Tsioras and Efthymiou 2007).

The current legislation (Presidential Decree 126/1986) provides many privileges to the FWCs. These privileges are in the framework of wood harvesting and utilization processes of the public forests. Forest workers' cooperatives are responsible for wood harvesting and for the sale of that wood, with the obligation of paying only a small amount of the profits as tax to the Greek State. This forest utilization system has replaced, in most forest complexes of the country, the former system of State Exploitation System (KEA). The members of the FWCs working under the KEA system are paid according to a per piece rate, which is determined every year by the Ministry of Rural Development and Food (Ministry of Rural Development and Food 2006). The Presidential Decree 126/1986 initially aimed at the facilitation of forest utilization in Greece. This would take place through the redistribution of income from the forests to the favor of the forest workers'

cooperatives. However, the social and environmental efficiency of the new forest utilisation system are under question (Efthymiou and Karambatzakis 1992; Gatzojannis and Koletsos 2001). Significant differences in terms of forest-related income among forest workers have been reported, as forest workers in some regions have been reported with especially high earnings (Efthymiou and Karambatzakis 1992) compared to forest workers in other regions who try hard to survive (Tsioras 2004).

The goals of the study were: (a) determine job satisfaction, perceived status and projected expectations of forest workers, as expressed by the same workers and by a panel of specialist experts; (b) suggest improvement measures that can increase job satisfaction, status and in general the attraction of forest jobs.

Materials and Methods

Selection of Participants

The comparison of perceptions of forestry experts and forest workers was chosen as a means to examine the current socioeconomic situation of the Greek forest workers. The selection of forestry experts was done according to the expert sampling method, which is regarded to give the most representative results where the personal experience of the respondents is crucial (Siardos 1997; Babbie 2009). Therefore, a list of forestry experts with long experience in forest operations was compiled, which included university professors, researchers, representatives of the private forest owners' union and experienced officers of the State Forest Service.

The selection of forest workers was difficult, due to their wide geographic spread, the isolation of their working conditions and the lack of up-to-date and detailed official data on the active members of the forest workers' cooperatives. The poor educational level of the forest workers represented another serious problem. As the pilot study revealed, despite the simplicity of the questionnaire, some respondents had difficulties in answering or avoided answering. Therefore, despite the increased costs entailed, it was decided that all study areas would be visited, so that the current situation would be examined on site. This selection method was justified by the findings of the study, since some cooperatives with especially strong presence in the past, had only few remaining members. As a result of the above mentioned situation, conducting personal interviews enabled timely and accurate collection of data.

The choice of the study areas was done in such way to ensure the sample representativeness with respect to the geographic distribution of forest workers cooperatives in Northern, Western and Central Greece, where the majority of forest operations take place. All the forest workers chosen to participate worked and lived in the area of the forest workers' cooperative. A list of all forest workers was compiled for every FWC examined and the interviewees were randomly sampled. The work experience of the forest workers was used as stratification criterion (1–10 years, 11–20 years, 20–30 years and more than 30 years). The number of participants per work experience group was estimated according to proportionate

stratified sampling (Weigand 2009). The latter criterion was introduced because the decisions and the functions of the FWCs can be affected by the distribution of the members' expertise.

Questionnaire and Interviews

The results in this article originate from a mailed questionnaire to forest operations' experts nationwide and personal interviews held with forest workers during the period October 2003–January 2004. The interviewees were all members of forest workers' cooperatives, in 13 prefectures in Greece. Data collection was based on a structured questionnaire with the majority of questions common for both groups. The remaining questions were designed to explore the perceptions of each group in special aspects of the study. Some of the questions were of the multiple-choice type, whereas a five-point Likert scale was used to measure the perceived level of importance (ascending scale from 1 to 5).

Each mailed questionnaire was accompanied by a cover letter explaining the background and purpose of the study. In its first part, profile information was asked from all respondents. Opinions on the current status and problems of the Greek forest workers and suggestions for improvement were asked in the second and third parts of the questionnaire respectively.

The questionnaire was initially designed based on the available literature (e.g. Jacob et al. 1994; Gandaseca and Yoshimura 2001; Strehlke 2003; Egan and Taggart 2004) and discussions with forest cooperatives' members, State Forest Service officers and forest researchers. The questionnaire was pre-tested with the help of ten forestry experts and ten forest workers to check for biased, misleading, or confusing questions. This was to verify the quality and comprehensiveness of the retrieved information. A detailed description of the questionnaire, including the organization and format of individual questions is presented in the thesis of P. Tsioras (Tsioras 2004).

Perceptions and attitudes of the forest workers were collected by means of personal interviews. Most of the forest workers initially had a negative attitude towards the study, questioning its future contribution. As a result of this, if the questionnaires had been sent by post a very small return rate would have been expected. Furthermore, low literacy level represented another problem suggesting the use of personal interviews as the best way of collecting data. The explanations given by the interviewer removed all their doubts. Finally, informal follow-up discussions were conducted in order to assure the validity of the findings.

Statistical Analysis

The data were analyzed with the software SPSS Version 12. Nonresponse bias for the forestry experts group was estimated by using chi-square analysis. The analysis was conducted in order to test possible differences between the early and late survey respondents on various questions of the study. No significant differences were found, suggesting that survey respondents and nonrespondents were from the same population (Armstrong and Overton 1977; Egan and Taggart 2004). The similar

analysis was conducted for the forest workers. Although none of them declined to participate, they could be divided into two groups, with regard to their initial attitude towards the study. For this reason, in order to test possible differences between the 44 “positive” and the 62 “negative” forest workers on various questions, chi-square analysis was conducted. The analysis revealed no significant differences between these two groups.

The criteria of normal distribution and homogenous variance of data were not met. Therefore, solely non-parametric analyses were used to explore comparisons between respondents’ sub-groups and the relationships between variables. Because the responses were ratings, rather than a continuous measure, these data were not suitable for analysis of variance (SPSS 1998). The non-parametric alternative to a repeated measures analysis of variance is the Friedman test. The scores for each variable are ranked and the mean ranks for the variables are compared (Leach et al. 2005). Furthermore, the Friedman test is used to determine whether the differences between these ranks are statistically significant.

Maximum likelihood χ^2 test ($P \leq 0.05$ and $P \leq 0.1$) was also used to test whether statistically significant differences could be found between the answers of the two groups of participants.

Categorical principal components analysis (CATPCA) was used in order to find consistencies between categories of variables, in our case responses of the study participants. CATPCA was performed with the help of the SPSS Categories module. It is a generalization of principal components analysis (PCA) which reduces the variables in a data set to a small number of principal components that represents the information in the variables as closely as possible (SPSS 2001). This optimal quantification of the categorical modalities of each variable can be obtained through an iterative ALS-Alternating Least Squares (Young et al. 1978). The ability of CATPCA to handle variables of different analysis levels (nominal, ordinal, and numerical) simultaneously and to deal with nonlinear relationships between variables has resulted in its use as an exploratory technique in empirical surveys (Gifi 1990; Siardos 1997; Linting et al. 2007).

Results

A total of 115 questionnaires were posted to forestry experts nationwide. After two reminding calls the number of returned questionnaires increased from 89 (77%) to 101 (88%). Two of the returned questionnaires had to be excluded from further analysis because they were not completed. The high return rate of completed questionnaires (86%) may be attributed to the interest of the respondents in the aims of the study (Atteslander 1974). Additionally, a total of 106 forest workers were interviewed.

Background Information on the Study Participants

The majority of the forestry experts were public officers (50%), university professors (30%) and researchers (7%). They had a professional experience average

of 23.47 years (sd ± 8.76 years) and 42% of them had acquired a Doctorate in Forestry.

Among the forest workers interviewed, 21% of them were chairmen of forest workers' cooperatives. The average age of the forest workers was 44.4 years (sd ± 11.04) and they had a professional experience average of 22.61 years (sd ± 10.55). The average age for first employment in forest operations was 21.73 years (sd ± 6.6). Also, the most frequent age for starting working as a forest worker is the age of 18 (14%), followed by the age of 22 (10%).

Approximately two-thirds of the forest workers (66%) have attended the primary education (sometimes incomplete) and only 22% have attended the secondary education. Finally, 61% of them have attended short courses on forest operations' issues held by the Greek Forest Service.

State of Forest Operations and Public Image of the Forest Workers in Greece

The interviewees were asked to describe their perception of state interest in forest operations. The responses of the forestry experts showed answers in three equal groups observing the state interest as either "very small", "small" or "medium". The forest workers were more pessimistic, as 77% of them assessed state interest as "very small".

The majority of forestry experts (64%) assessed the public image of the forest worker as "neither good nor bad" (Table 1). On the contrary, the public image according to the forestry workers varied from "very poor" (32%) to "very good" (24%). Such large differences may be attributed to the special conditions of forest operations (e.g., number of forest workers and FWCs, annual income) in the different study areas ($\chi^2 = 56.830$, $df = 4$, $P < 0.001$).

Forestry experts assessed that the public image of the forest worker in the period 2000–2004 has either "remained unchanged" (60%) or "deteriorated" (31%). According to the majority of the forestry workers, their public image has deteriorated (56%), while 41% of them stated that it has "remained unchanged" ($\chi^2 = 12.456$, $df = 2$, $P = 0.002$).

Forestry experts rated the professional capacity of the forest workers from "poor" (32%) to "fair" (54%), whereas the forest workers rated it from "fair" (41%) to "very good" (28%) ($\chi^2 = 91.75$, $df = 4$, $P < 0.001$) (Table 2).

Table 1 Public image of the forest worker's job

Public image assessment	Forest experts (%)	Forest workers (%)
Very good	2	15
Good	12	24
Neither good nor bad	64	20
Bad	15	9
Very bad	6	32

($\chi^2 = 56.83$, $df = 4$, $P < 0.001$)

Table 2 Professional capacity of the Greek forest workers

Professional capacity	Forestry experts (%)	Forestry workers (%)
Very good	0	28
Good	9	41
Fair	54	31
Poor	32	0
Very poor	5	0

($\chi^2 = 91.75$, $df = 4$, $P < 0.001$)

Job satisfaction and problems of the Greek forest workers

The forest workers were asked to assess their total job satisfaction, which should represent both their working conditions and income. The majority of the forest workers (51%) were “very dissatisfied” and 26% of them were “neither dissatisfied nor satisfied”. During the follow-up discussions most forest workers justified their dissatisfaction as a result of their low income.

Forest workers were also asked to assess the importance of their most common problems (Table 3). The analysis of their answers with the Friedman test, revealed that all problems are perceived to have different importance ($\chi^2 = 307.6$, $df = 9$, $P < 0.0001$). Income-related problems are rated as the most important ones, followed by “Job difficulty” along with “Small state interest”. It should be stressed that the interviewed forest workers do not regard either high accident frequency or work-related illnesses as important problems. They are also quite satisfied with the way their forest workers’ cooperative is organized and functions.

Another important finding is that 72% of the interviewees were injured during the semester prior to the study period and 36% of them had a serious job accident during the last 5 years. A serious accident was defined as requiring medical treatment at a hospital and a recovery period of at least 5 days. Unfortunately, the lack of official data inhibits further analysis of the accident frequency and injury

Table 3 Perceived importance of the Greek forest workers’ problems (Min =1, max =10)

Problem	Mean rank
Low income	6.53
Financial uncertainty	6.12
Seasonal employment	5.71
Job difficulty	5.68
Small state interest	5.32
Poor professional prestige	4.56
High accident frequency	4.35
Wish to change my kind of living	2.38
Work-related illnesses	2.29
Lack of professionalism in my forest workers’ cooperative	2.06

($\chi^2 = 307.6$, $df = 9$, $P < 0.0001$)
Friedman test

recovery duration, thus undervaluing the severity of some accidents which in some cases was described to be high.

According to almost two-thirds (65%) of the respondents, the young people in the mountainous areas choose not to work in forest operations. Instead, they prefer moving to large cities to seek better career opportunities. However, individual cases have been recorded where young people returned to their communities to be re-employed as forest workers.

The future contribution of a forest workers' training system to Greek forestry is assessed by both groups of respondents as very important ($\chi^2 = 1.22$, $df = 2$, $P = 0.543$). Such a contribution is assessed as "very important" (67% and 70% respectively) and "important" (23% and 23% respectively). Their optimistic perception is shown by a willingness to participate if forest workers' training courses were made available in the future. This is expected to be more than satisfactory, ranging from "satisfactory" to "large" for 80% of the forestry experts and from "satisfactory" to "very large" for 82% of the forest workers.

Eight variables were used in total for the application of the CatPCA method; Three of these were measured on the ordinal scale and five on the nominal scale. The variables used were the following: age group (AGE_GROUP: ordinal, 1–5), future need for forest workers (NEED_FW: binary, 1–2), job satisfaction (JOB_SATISF: ordinal, 1–5), seminar participation (SEM_PART: binary, 1–2), injury during the last six months (INJURY: binary, 1–2), serious accident in the last five years (ACCIDENT: binary, 1–2), employment of young people in forest professions (YOUNG_PEOPLE: binary, 1–2), public image of the forest worker's job (PUBL_IMAGE: ordinal, 1–5).

The convergence criterion value of 0.00001 was met after 35 iterations. The two-dimensional solution resulted in eigenvalues of $\lambda_1 = 1.81$ and $\lambda_2 = 1.49$ for the first (PC1) and second principal component (PC2) respectively. Each of these eigenvalues exceeds the acceptance value of 1 (Meulman and Heiser 2001). This, combined with the fact, that 88% of the total variance can be explained in relation to PC1 and PC2 respectively, suggest the use of a two-dimensional analysis in this set of data.

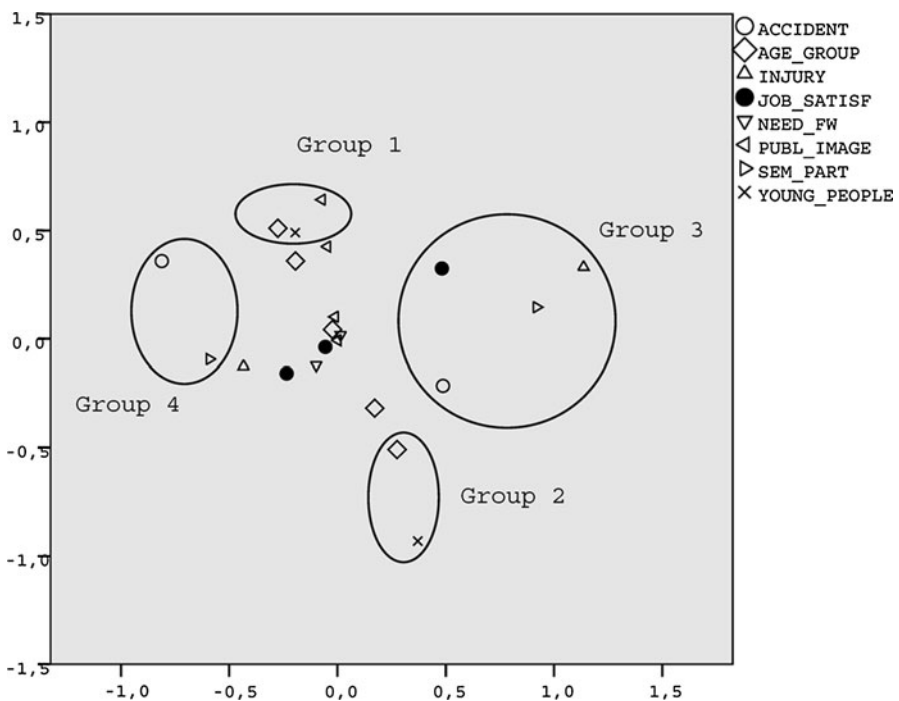
The values of the variable loadings for the two principle components are described in Table 4. The variables "Seminar participation", "Injury during the last 6 months" and "Serious accidents" present very high positive loadings in relation to PC1 and form a group that could be interpreted as "Personal attributes of the forest workers". Similarly, and the variables "Public image of the forest worker's job" and "Employment of young people in forest professions" form a second group due to their high loadings in relation to PC2. This group could be interpreted as "Social attributes". Finally, the variable "Job satisfaction" presents the highest negative loadings in relation to both principal components.

The CatPCA programme provides scores to variable categories, based on which a dispersion diagram is created. Coordinates for variable categories along each dimension are shown in Fig. 1.

Certain variable categories are consistent. With regard to the first dimension, there is consistency (value of the variable categories above 0.5 or below -0.5 in both dimensions) between the following categories: "Age group: More than

Table 4 Component loadings of the variables used in the CatPCA analysis

Variable	Component loadings	
	Component 1	Component 2
Age group	-0.23	0.28
Satisfaction	-0.56	-0.43
Seminar participation	0.71	0.17
Injuries	0.68	0.24
Serious accidents	0.61	-0.23
Public image	-0.16	0.80
Young people in forest professions	-0.30	0.66
Future need for forest workers	-0.05	-0.11

**Fig. 1** Joint plot of the variable categories used in the CatPCA analysis

50 years old” “Job satisfaction: Very dissatisfied”, “Future need for forest workers: No (Group 1). Group 2 consists of the categories “Age group: 20–30 years old” and “Employment of young people in forest professions: Yes”.

With regard to the second dimension two more groups are formed. Group 3 consists of the categories “Seminar participation: No” and “Injury during the last 6 months: No”, “Job satisfaction: Satisfied” and “Serious accident in the last 5 years: No”. Finally, another group is formed in this dimension by the categories

“Seminar participation: Yes”, “Injury during the last 6 months: Yes” and “Serious accident: Yes” (Group 4).

Discussion

Social aspects are increasingly recognized as an integral part of sustainable development and therefore of sustainable management of forests and other natural resources. Forest-based employment is one key material benefit from forestry to society (Blombäck et al. 2003). Strehlke (2003) provided an interesting presentation of the forest workers’ problems around the globe. The lack of data on the Greek forest workers’ perceptions of their professional problems initiated the present study. Although the study is 6 years old, not much has changed in Greek forestry during this time period. Personal contacts with forest workers and State forest officials reveal similar, with the described, perceptions on the current situation. Also, the forest utilization system remains the same and no legislative or institutional changes have taken place. These reasons make us believe that the findings of this study are still valid and can clarify the prevailing situation as well as provide useful data for further studies. Furthermore, the findings imply respective forest policy measures in the future.

State interest in forest operations is perceived by both groups of respondents as low. This could be partly attributed to the lack of extension activities, a fact which strengthens the feeling of professional isolation. Furthermore, low state interest is perceived through the poor status of forest operations. This is to a large extent due to practices aiming at increasing employment, such as provision of employment to the maximum possible numbers of FWCs, which, in some cases result in poor quality of forest operations. However, a high level of forest operations is possible can be achieved only through higher professional capacity, better organization and advanced work quality on behalf of the forest workers cooperatives. Also, incentives such as equipment subsidies and earlier retirement could be perceived as real state interest for the forest operations sector (Tsioras 2010).

The professional capacity of the forest workers was assessed as poor by the forestry experts. On the contrary, forest workers assess their work capacity as rather good, based solely on their subjective judgement. This was expected since most of the Greek forest workers don’t have certified qualifications but rely on their work experience. Such knowledge may be unsystematic and haphazard, but can be supplemented through systematic adult training (Vik 1999) or other training initiatives (Helmkamp et al. 2004). Another factor seriously affecting the managerial and entrepreneurial potential of the forest workers’ cooperatives is the choice/election of their chairmen, which, in most cases, are the elder and more experienced forest workers. This age-experience criterion is not always justified, because the organizational and operational level of examined cooperatives, whose chairmen were chosen on grounds of their educational level, was found to be considerably higher.

The job of the forest workers is a very difficult one, often related to illnesses and injuries (Poschen 1997; Axelsson 1998). Job difficulty represents a major reason for

quitting employment in forestry (Jacob et al. 1994) while accidents or work-related illnesses have the same result (Poschen 1993). Although the interviewed forest workers perceive job difficulty and high accident rates as part of their job, they seem to be more troubled by their low income. The fact that they perceived the significance of frequent accidents as low could be the cause of their engagement in multiple unsafe behaviors (Bordas et al. 2001). This unwillingness to change their attitude may be attributed to unawareness of hazards during work, which can be experienced even in forest workers with many years of professional experience. However, high accident rates and increased severity of accidents have been recorded in Greek forest operations by Efthymiou (1990). The present study also reveals the inefficiency of training seminars in the past, as their participants have been involved in more accidents (injury incidents and serious accidents) in comparison to the forest workers who never participated in such seminars (Group 3 and 4 of the CatPCA analysis). The reason for this may be found in the very nature of these seminars, which lasted only for a few days and were never repeated. Furthermore, underreporting of accidents during forest operations is another problem, making the analysis of accident frequency and severity in the forest operations sector impossible. In this context, another need can be identified: A new accident recording system should be developed, which will facilitate more elaborate research on the various social and economic implications of accidents and health problems related to forest operations on the current workforce, as well as the national forestry. Such an analysis would possibly initiate further actions in the promotion of a safer working environment.

Job quality can be measured in numerous ways (Moseley and Reyes 2006). In the present study the forest workers assessed their job satisfaction as low. Low income and seasonal employment are their most serious concerns, as studies in other countries have also shown (Gandaseca and Yoshimura 2001; Yoshimura and Acar 2004). Forest workers above the age of 50 are more dissatisfied (Group 1 of the CatPCA analysis), whereas the young people who participated in the study assessed the public image of the forest worker's job as very good (Group 2 of the CatPCA analysis). This finding may indicate the connection between the positive public image of the forest worker's job in some areas and its selection by the young people, which is described in other studies (Egan and Taggart 2004; Egan and Taggart 2009). It is interesting to note that the forest workers employed at the Aristotle University forests of Pertouli and Taxiarchis were considerably more satisfied with regard to their wage and employment conditions, a result of the special management and utilization status of these forests.

The introduction of a forest workers' training system should be regarded as the first step taken towards the, currently non-existent, certification of the professional qualifications. Institutional and legislative changes are also needed, in order to provide the necessary support. According to Blombäck et al. (2003) the trend is positive for well-trained forest workers under stable employment conditions and negative for poorly trained and equipped occasional wood-cutters, such as farmers. It is therefore necessary to implement initiatives, training programmes and certification of professional qualifications as many analogous success stories from various European countries are presented by Blombäck et al. (1997). Similar

findings for Greece are reported in Tsioras (2004). Precondition for successful organisation of forest workers' training programmes is the contact with the target audience, which will maintain the relevancy and credibility of the programmes' content and delivery (Egan 2005).

During the follow-up discussions, the majority of the forest workers expressed their unwillingness to give up their employment in the forest operations, despite their low job satisfaction. Their attitude is explained by "the way of life in their communities" and their "uncertainty in achieving a higher income in a city". Although confused and dissatisfied by the prevailing situation, the majority of forest workers would support actions and initiatives aiming at the improvement of the forest management and, consequently, the forest operations sector, even if these actions would mean stricter control of their cooperatives or introduction of a forest workers' training system. They were also willing to participate in training programmes, despite the difficulties entailed. Similar findings are reported by Yoshimura and Acar (2004), where sustainable forest management is regarded by Turkish forest workers as a source of income and welfare for the local people.

Maintaining or increasing the current forestry workforce is a very difficult objective, affecting in various ways the proper forest management and utilization. This objective gained in importance and difficulty especially during the last decades because of the ever decreasing employment in the forest operations sector. The present study identifies certain problems and weaknesses of the Greek forest operations sector through the perceptions of highly experienced forestry experts and forest workers. What is now needed is a move from the present situation to a more professional status, including stricter control of the forest workers' cooperatives and a significant upgrade of their professional capacity through the participation of their members in training seminars, in order to obtain a well-qualified forestry workforce. At the same time, legislative and institutional changes will enable the rationalization of the forest operations sector by formulating and supporting a new and well-defined development framework. Such changes should constitute primary objectives of the national forest policy as they address the very core of rural development; the achievement of sustainable forest management through the provision of employment to rural populations.

Acknowledgments The author wishes the Editor and the two anonymous reviewers for their thoughtful comments and recommendations. Mr. Mark Paul Hedley is thanked for editing the text and improving the English in the manuscript, as well as the forestry experts and forest workers who participated in this study.

References

- Armstrong JS, Overton TS (1977) Estimating nonresponse bias in mail surveys. *J Marketing Res* 14:396–402
- Atteslander P (1974) *Methoden der empirischen Sozialforschung*. Walter de Gruyter Verlag, Berlin
- Axelsson A (1998) The mechanization of logging operations in Sweden and its effect on occupational safety and health. *Int J For Eng* 9:25–31
- Babbie ER (2009) *The practice of social research*, 12th edn. Wadsworth Publishing, Belmont

- Blombäck P, Ris T, Jost D, Buechel M, Raemy O (eds) (1997) Safety and Health in forestry are feasible. Federal Office of Environment, Forests and Landscape, Bern
- Blombäck P, Poschen P, Lövgren M (2003) Employment trends and prospects in the European Forest Sector—a study prepared for the European Forest Sector Outlook Study (EFSOS). United Nations, New York
- Bordas RM, Davis GA, Hopkins BL, Thomas RE, Rummer RB (2001) Documentation of hazards and safety perceptions for mechanized logging operations in East Central Alabama. *J Agric Saf Health* 7:113–123
- BUS/BUWAL (2003) Wald und Holz—Jahrbuch. Bundesamt für Statistik/BUWAL, Eidg. Forstdirektion
- Efthymiou PN (1989) Ergonomic problems and accidents in the mountain logging of Greece. In: Proceedings of the Seminar on the mechanization of harvesting operations in mountainous terrain, Antalya/Turkey 20–24 Nov 1989. FAO/ECE/ILO, Geneva and Rome
- Efthymiou PN (1990) Situation of occupational safety in forest operations of Greece. Invited paper at the European seminar on occupational safety in Forestry, Munich, 5–6 July 1990
- Efthymiou PN (1992) Lack of infrastructure leads to underdevelopment of forest works. In: Proceedings of the 5th Panhellenic Congress of the Hellenic Forestry Society. Hellenic Forestry Society, Thessaloniki, pp 262–270 (In Greek)
- Efthymiou PN (2001) Forest protection and forest work. In: Konstantinidis PN (ed) Forest growth and protection—Forest work. Ministry of Agriculture and NAGREF, Thessaloniki, pp 57–71 (in Greek)
- Efthymiou PN, Karamatzakis T (1992) Evaluation of the wood harvesting and trade system by the forest workers' cooperatives with the Presidential Decree 126/86. In: Proceedings of the 5th Panhellenic Conference of the Hellenic Forestry Society. Hellenic Forestry Society, Thessaloniki, pp 321–328 (in Greek)
- Egan AF (2005) Training preferences and attitudes among loggers in northern New England. *For Prod J* 55(3):19–26
- Egan A, Taggart D (2004) Who wil log? Occupational choice and prestige in northern New England. *J For* 102(1):401–406
- Egan A, Taggart D (2009) Public perception of the logging profession in Maine and implications for logger recruitment. *North J Appl Forestry* 26(3):93–98
- FAO (2010) Global Forest Resources Assessment 2010—Key findings. <http://foris.fao.org/static/data/fra2010/KeyFindings-en.pdf> (Accessed 25 May 2010)
- Gandaseca S, Yoshimura T (2001) Occupational safety, health and living conditions of forestry workers in Indonesia. *J For Res* 6:281–285
- Gatzojannis S, Koletsos K (2001) Forest Management in Greece, modern needs. In: Konstantinidis PN (ed) Forest growth and protection—forest work. Ministry of Agriculture and NAGREF, Thessaloniki (In Greek)
- Gifi A (1990) Nonlinear multivariate analysis. Wiley, Chichester
- Gröger V, Lewark S (2002) Der arbeitende Mensch im Wald—eine ständige Herausforderung für die Arbeitswissenschaft. Wirtschaftsverlag N. W. Verlag für neue Wissenschaft, Dortmund-Berlin-Dresden
- Helmkamp JC, Bell JL, Lundstrom WJ, Ramprasad A, Haque A (2004) Assessing safety awareness and knowledge and behavioral change among West Virginia loggers. *Inj Prev* 10:233–238
- Jacob J, Huber M, Wirz R, Härle PR, Lewark S (1994) Warum wechseln Walдарbeiter ihren Beruf? *Allg Forst Jagdztg* 165:1–6
- Leach N, Barrett KC, Morgan GA (2005) SPSS for intermediate statistics, 2nd edn. Lawrence Erlbaum Associates, Mahwah
- Lewark S, Härle PR (1991) Das Ausscheiden von Walдарbeitern der Staatsforstverwaltung 1983 bis 1990. Frühinvalidität und Berufswechsel am Beispiel des Bezirks Darmstadt. *Allg Forstz für Waldwirtschaft und Umweltvorsorge* 46:470–474
- Lindroos O, Burström L (2010) Accident rates and types among self-employed private forest owners. *Acc Anal Prev* 42(6):1729–1735
- Linting M, Meulman JJ, Groenen PJF, Van der Kooij AJ (2007) Stability of nonlinear principal components analysis: an Empirical study using the balanced bootstrap. *Psychol Methods* 12:359–379
- Meulman JJ, Heiser WJ (2001) SPSS 11.0 Categories. SPSS Inc., Chicago
- Ministry of Rural Development and Food (2006) Activity report for the year 2005 of the Greek State Forest Service. Ministry of Rural Development and Food, Athens (in Greek)

- Mitchell R, Driscoll T, Healey S, Mandryk J, Hendrie L, Hull B (2001) Fatal injuries in forestry, logging work in Australia, 1989 to 1992. *J Occup Health Saf Aust NZ* 17(6):567–577
- Moseley C, Reyes YE (2006) Job quality in logging and forestry services in Oregon. Ecosystem Workforce Program, Paper Number 13, University of Oregon
- National Statistical Service of Greece (2008) Information retrieved from the website www.statistics.gr (Accessed 22 Oct 2008)
- OECD (2000) Employment outlook. OECD, Paris
- Poschen P (1993) Forestry, a safe and healthy profession? *Unasylva* 44:3–12
- Poschen P (1997) Forestry and employment—much more than meets the eye. In: Proceedings of the Eleventh World Forestry Congress, Antalya, Turkey. <http://www.fao.org/forestry/docrep/wfcxi/publi/V4/T20E/1.htm> (Accessed 21 May 2010)
- Salminen S, Klen T, Ojanen K (1999) Risk taking and accident frequency among finnish forestry workers. *Saf Sci* 33:143–153
- Siardos GK (1997) Methodology of social research in agriculture. Ziti Publications, Thessaloniki (in Greek)
- Siardos GK (1999) Methods of multi-variable statistical analysis. Ziti publications, Thessaloniki (in Greek)
- SPSS (1998) SPSS base applications guide. SPSS, Chicago
- SPSS (2001) SPSS 11.0 Tutorial. SPSS Inc., Chicago
- Strehlke B (2003) How we work and live: forest workers talk about themselves; A global account of working and living conditions in the forestry sector. ILO, Geneva
- Tsioras PA (2004) Analysis and formation of modern forest workers' training systems for the Greek Forestry. Dissertation, Aristotle University of Thessaloniki (in Greek with summary in English)
- Tsioras PA (2010) Future perspectives of the forest workers in Greece. *Iforest* 3:118–123
- Tsioras PA, Efthymiou PN (2007) Need for forest workers' training system in Greek forestry. *Geotech Sci Issues* 18(2):46–56 (in Greek with summary in English)
- Uusitalo J, Markkola JM (2006) Entrepreneurship in forestry—is it worth activating? *For Stud* 45:67–73
- Vik T (1999) Improving working conditions in forestry—an example from Norway. In: Proceedings of the Seminar “Improving working conditions and increasing productivity in forestry”. Forest Research Institute, Zvolen, pp 51–65
- Weigand C (2009) Statistik mit und ohne Zufall, 2nd edn. Springer, Heidelberg
- Yoshimura T, Acar HH (2004) Occupational safety and health conditions of forestry workers in Turkey. *J For Res* 9:225–232
- Young FW, Takane Y, De Leeuw J (1978) The principal components of mixed measurement level multivariate data: an alternating least squares method with optimal scaling features. *Psychometrika* 43:279–281